

REMARKS

The Examiner is thanked for the careful examination of the application, and for the suggestions for amending the application. The Examiner is also thanked for discussing this matter with Applicants' attorney. However, in view of the foregoing amendments and the remarks that follow, the Examiner is respectfully requested to reconsider the application and withdraw the outstanding rejections.

The foregoing amendments are styled on the assumption that the amendments filed on December 9, 2003 were not entered.

Disclosure:

In the Official Action dated March 4, 2004, the Examiner alleges that the Amendment filed on December 9, 2003 allegedly introduces new matter into the disclosure. Applicants submit that the Amendment should not be considered new matter, and thus should have been entered. The explanation for this is set forth with regard to the attachments.

The present application is a Section 371 filing of International PCT Application No. PCT/GB00/00704. A copy of the international application as published as WO 00/51470 on September 8, 2000 is attached as Exhibit 1. As can be seen from Exhibit 1, the bottom of page 6 includes an explanation as to how certain data can be excluded by carrying out a double differential of the load displacement curve. Since the international filing date of February 28, 2000 is considered to be the first effective U.S. filing date of the present application, Applicants submit that the date

for determining the scope of the disclosure should be what was filed on February 28, 2000 in the international application. Accordingly, Applicants submit that the three lines at the end of page 6 in attachment 1 should properly be considered part of the filed application.

Furthermore, when the present application was filed as a Section 371 application with the U.S. Patent and Trademark Office, a complete copy of the original application, as published on September 8, 2000, was also submitted to the U.S. Patent and Trademark Office. Accordingly, the portion of page 6 which includes the explanation of excluding data was also filed with the U.S. Patent and Trademark Office on September 5, 2001, when the Section 371 application was filed.

Unfortunately, during the international preliminary examination of the international application, an "Amended Sheet" for page 6 was filed at the international stage. See Exhibit 2. The Amended Sheet inadvertently omitted the last three lines of page 6. The Examiner's conclusion that the Amendment filed on December 9, 2003 includes new matter was based on a review of the "Amended Sheet" for page 6, rather than the page 6 which was filed in the international application and with the U.S. Patent and Trademark Office when entering the national phase.

Accordingly, Applicants submit that for at least the two reasons set forth above, the last three lines of the "substitute sheet" page 6 should be considered part of the application as filed, and that as a result, the amendments filed on December 9, 2003 are clearly not new matter. To be consistent with the "Amended Sheet" page

6, in the amendment to the specification set forth herein, the relevant portion of page 6 that was not included in the "Amended Sheet" is underlined.

During our telephone conversation with the Examiner in March of this year, the Examiner appeared to agree that if the subject matter was in fact included in the international application, and the copy thereof was filed with the U.S. Patent and Trademark Office when entering the national stage, then it was likely that the subject matter would not be considered new matter. Accordingly, Applicants respectfully request the Examiner to reconsider and withdraw the determination that the amendments filed on December 9, 2003 constitute new matter under 35 U.S.C. §132.

By similar analysis, the rejection of claims 1-8 and 10 under 35 U.S.C. §112, first paragraph, should also be withdrawn. In other words, the objected to matter was not in fact new matter.

With regard to claim 13, that claim has been amended so that there is no longer any issue concerning antecedent basis.

Art Rejections:

In the latest Official Action, the Examiner has not raised any rejections based on prior art. However, to the extent that any such issues continue, the Examiner is respectfully requested to review the relevant sections of the remarks filed on December 9, 2003, wherein the previously applied prior art is discussed with regard to claims 1-7. If the Examiner has any questions concerning the prior art discussion,

the Examiner is respectfully urged to telephone the undersigned attorney so that prosecution of the application may be expedited.

Respectfully submitted,

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/GB00/00704 (22) International Filing Date: 28 February 2000 (28.02.00) (30) Priority Data: 9905005.6 5 March 1999 (05.03.99) GB (71)(72) Applicants and Inventors: BAIN, Duncan, Shirreffs [GB/GB]; 531a North Deeside Road, Cults, Aberdeen (GB). FERGUSON-PELL, Martin [GB/GB]; 9 The Leys, Chesham Bois, Buckinghamshire (GB). DAVIES, Patrick, John [AU/AU]; 1 Colthorpe Street, Bondall, QLD 4034 (AU). (74) Agent: WOODCRAFT, David, Charles; Brookes & Martin, High Holborn House, 52/54 High Holborn, London WC1V 6SE (GB).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: APPARATUS FOR THE ASSESSMENT OF MATTRESSES		
(57) Abstract		
<p>Apparatus is described for objectively testing the condition of a support surface such as mattress. The apparatus comprises a frame (8, 21, 22) for extending over the support surface, an indenter (5) mounted on said frame and a load sensor (4) disposed between the indenter and the frame, manually operated means (6) for pressing the indenter into the support surface, displacement measuring means for measuring the movement of the indenter into the support surface and data processing means (7) for analysing the force applied to the indenter in relation to the displacement of the indenter into the support surface.</p>		

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APPARATUS FOR THE ASSESSMENT OF MATTRESSES

This invention relates to apparatus for the assessment of a support surface such as a mattress, so as to determine objectively whether the support surface has worn out.

There are many instances where it is desirable to provide an objective test of the condition of a support surface such as a mattress. For example, it is known that mattresses have a finite life span and that after a period of use, they begin to lose their resilience and this leads to the phenomenon known as "bottoming". This refers to the yielding of the mattress to such an extent that the occupant comes into contact with the hard base of the bed.

In hospitals, such a condition represents a serious hazard which greatly increases the risk of patients developing pressure sores. Since the treatment of pressure sores constitutes substantial expense to the hospital in terms of increased bed occupancy and nursing care, it is desirable to detect deterioration of mattresses at an early stage and dispose of them before the above hazardous condition is reached.

While fatigue of a mattress is related to its age, this is only one factor and mattresses and other support surfaces cannot be discarded simply on an age basis, since this would lead to disposal of many mattresses which are still in a serviceable condition.

The present established method of determining whether hospital mattresses are in a useable condition is the so-called "nurse fist test". In this test, an experienced operative manually depresses the mattress at three defined points along

its length and subjectively forms an opinion as to the condition of the mattress. However, this subjective test has been shown to suffer from poor repeatability and inter operator reliability.

The present invention, therefore, is directed to the provision of apparatus and method for objectively determining the condition of mattresses and other support surfaces, such as seats and wheelchair cushions.

According to one aspect of the present invention there is provided apparatus for assessing the condition of a person support surface which comprises a frame for extending over the support surface, an indenter mounted on said frame and a load sensor disposed between the indenter and the frame, manually operated means for pressing the indenter into the support surface, displacement measuring means for measuring the movement of the indenter into the support surface and data processing means for analysing the force applied to the indenter in relation to the displacement of the indenter into the support surface.

In general, the apparatus according to the invention will be portable and has a frame which is supported either from the bed base below the mattress, or from a base member which is adapted to extend beneath the bed base.

In a preferred form of the invention, the frame is supported in cantilever from one side of the support surface and the indenter is moved downwardly to depress the support surface by pressure applied to a handle by an operator. The frame may include guide means to guide movement of the indenter in an essentially vertical manner into contact with the support surface.

It has been found that a parallelogram frame is suitable to guide movement of the indenter along an essentially vertical path.

In the case of a hospital bed, the frame may be temporarily attached to the support frame of the bed, e.g. by a clamping device, and may be moved to different positions along the bed so as to test the mattress condition in the normal standard points along its length. These generally are one quarter, one half and three quarters of the distance from the head of the bed approximately along a centre line. In the case where the bed has no convenient frame for attachment of the testing apparatus, the frame may be in the form of a C-shaped structure having a base portion adapted to extend beneath the base of the bed, while the upper part of the frame extends over the mattress and enables the indenter to be brought into contact with the surface of the mattress.

The indenter preferably has a curved surface and may, for example, comprise a part of or a complete wheel or sphere.

In use, the indenter is depressed into the mattress until resistance is felt by the operator. A load cell mounted between the indenter and the frame measures the load applied, while displacement of the indenter into the bed is simultaneously measured by a suitable device. In the case where the whole or a part of the frame pivots in cantilever from a support, displacement is conveniently measured by means of a rotary potentiometer or equivalent rotation measurement device which measures pivoting movement of the frame and thus, indirectly, the displacement of the indenter.

Further features of the present invention will become apparent from the accompanying drawings, in which:-

Figure 1 is a side elevation of one embodiment of the testing apparatus in accordance with the invention;

Figure 2 is a similar view of the apparatus attached to a bed frame in position to test a mattress;

Figure 3 is a perspective view of the apparatus shown in Figures 1 and 2;

Figure 4 is a modified apparatus designed for use with beds having no convenient bed frame; and

Figure 5 is a typical load displacement curve obtained by using the apparatus of the invention.

Referring to Figures 1, 2 and 3, the mattress testing apparatus comprises a frame A including a vertical post (20) for attachment by a clamp (3) to a longitudinal member (13) of a bed frame (11). The vertical post (20) can be rapidly attached to one of the longitudinal members (13) in a desired position by clamp (3) so that the apparatus extends across the bed as shown in Figure 2. Mounted on the post (20) is a parallelogram structure (8) comprising horizontal and vertical members (22,21) pivotably linked by pivot pins (1).

Incorporated in one of the pivot pins (1) is a rotary potentiometer or other rotary measurement device (2) which measures the angle between the vertical bar (21) and the horizontal bar (22) which, together with the upper part of the post (20) and the other horizontal bar, form the parallelogram structure (8). The upper bar

(22) extends in a direction away from the post (20) and is connected to a handle (6) which can be depressed by the operator to force an indenter (5) into contact with the bed in the direction of the arrow (14) shown in Figure 2.

Mounted between the parallelogram frame (8) and the indenter (5) is a load cell (4). The load cell may be an 'S' or 'C' shaped beam whose distortion under load is transmitted by an electrical signal to a microprocessor.

The indenter wheel (5) is free to rotate about axle (9) which relieves side loads which might be applied to the load cell when the indenter wheel is acting against a horizontal surface. The side loads may otherwise arise from the arc effect of the movement of the linkage. Preferably, a pair of parallel arranged wheels (which may be mounted coaxially) may be employed. This arrangement represents the bony ischial protrusions of a user of the mattress.

A control box (7) is mounted adjacent the handle and contains an analogue to digital converter. Force and displacement information are analysed by a microprocessor contained within the control box (7). Calculations are performed based on the force displacement curve generated by analysing the force displacement data, generated by the rotary potentiometer and the load cell. The results of these calculations are then displayed to the user on an LCD, or other indicating device on the control box.

The control box may also be arranged to report that a proper measurement has been taken and may convert the load displacement data to a single number which rates the condition of the mattresses tested.

Figure 4 is a side elevation of a modification of the apparatus shown in Figures 1, 2 and 3. The upper part of the apparatus is constructed in the same way as in Figures 1, 2 and 4 and the same reference numerals are used to identify equivalent components.

In Figure 4, the vertical support post (20) is mounted on a platform (42) which may be supported on castors (43). The vertical profile of the platform and castors is low so that it can readily be pushed beneath a bed base (41), which may be of the divan type. In use, the apparatus is pushed beneath the bed base (41) until the post (20) touches the vertical side of the bed base. Handle (6) is depressed to bring the wheel into contact with the surface of the mattress (12) and is pushed into the mattress until maximum resistance is felt and the console (7) indicates that a proper reading has been taken. Data is then processed in the same way as described herein.

It is important to be able to test the mattresses when they are lying on an existing bed frame so that measurements can be taken in situ. In order to grade mattresses independently of the supporting frame, it is necessary to exclude the displacement of the base when the test is carried out. This is done by assuming that the load displacement curve of the mattress base is a straight line. This part of the data measured can be excluded by carrying out a double differential of the load displacement curve. This results in a figure which indicates the position of the elbow of the curve which is a function of the behaviour of the mattress. A typical load/displacement curve is given in Figure 5 from which the elbow (51) can clearly be seen.

The microprocessor can also be linked to a device for printing off data about the mattress in the form of a label, which can then be attached to the mattress and re-examined subsequently. The label can be in the form of a printed plastic strip or, in another embodiment, incorporate salient information including the identification of the mattress and the measurement recorded at a previous test. Conveniently, the label may be placed in a pocket in the mattress or cover or attached by pressure sensitive adhesive. If the information is recorded, e.g. on a magnetic strip or on a bar code, it may be machine-readable.

CLAIMS:-

1 Apparatus for assessing the condition of a person support surface which comprises a frame for extending over the support surface, an indenter mounted on said frame and a load sensor disposed between the indenter and the frame, manually operated means for pressing the indenter into the support surface, displacement measuring means for measuring the movement of the indenter into the support surface and data processing means for analysing the force applied to the indenter in relation to the displacement of the indenter into the support surface.

2. Apparatus according to claim 1 wherein the frame is supported in cantilever from one side of the support surface.

3. Apparatus according to claim 1 or 2 wherein the frame includes means for removable attachment to a bed base for supporting a mattress.

4. Apparatus according to claim 2 wherein the frame is supported from a base member adapted to extend beneath a bed base, while said frame is adapted to extend in cantilever over a mattress supported on said bed base.

5. Apparatus according to any one of the preceding claims wherein said manually operated means comprises a handle for depressing the indenter into the support surface.

6. Apparatus according to any one of the preceding claims wherein the indenter comprises a curved surface mounted for rotational movement on said frame.

7. Apparatus according to claim 6 wherein the curved surface comprises a wheel or sphere.

8. Apparatus according to any one of the preceding claims wherein the frame comprises a parallelogram linkage.

9. Apparatus according to any one of the preceding claims wherein said processing means includes means for assigning an identifying code to the support surface to be tested and for preparing a label bearing said code and data relating to the behaviour of the mattress when tested.

10. A method of testing a mattress in situ on a bed base which comprises applying to the surface of the mattress an indenter, depressing the indenter into the mattress, measuring the displacement of the indenter as a function of the load applied to the indenter, constructing a load/displacement curve and discriminating the displacement arising from deflection of the bed base to thereby identify the load/displacement relationship of the mattress.

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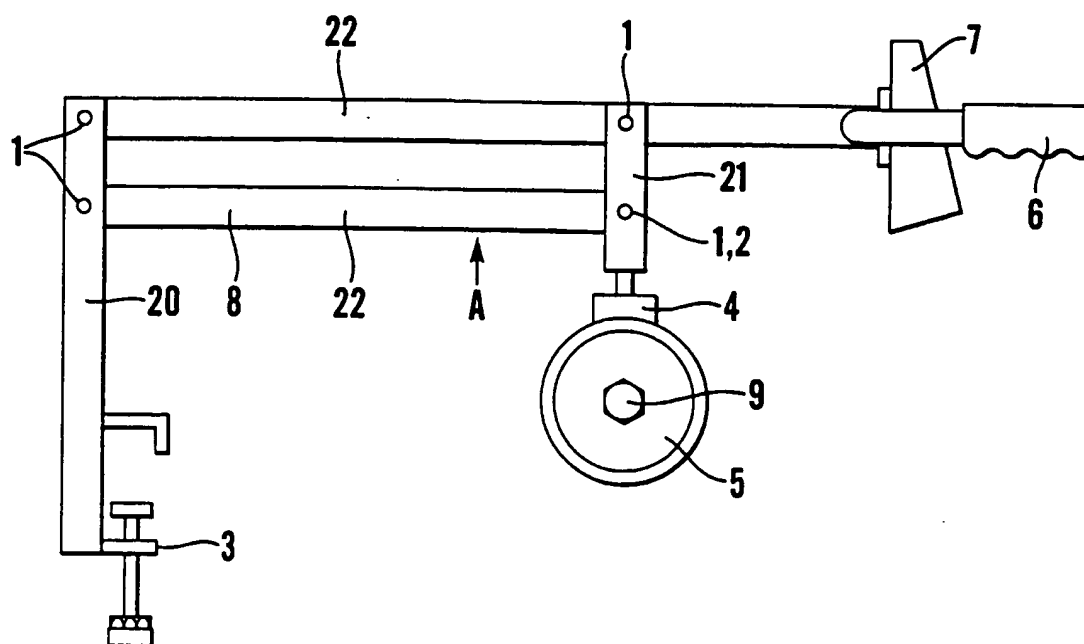


Fig. 1

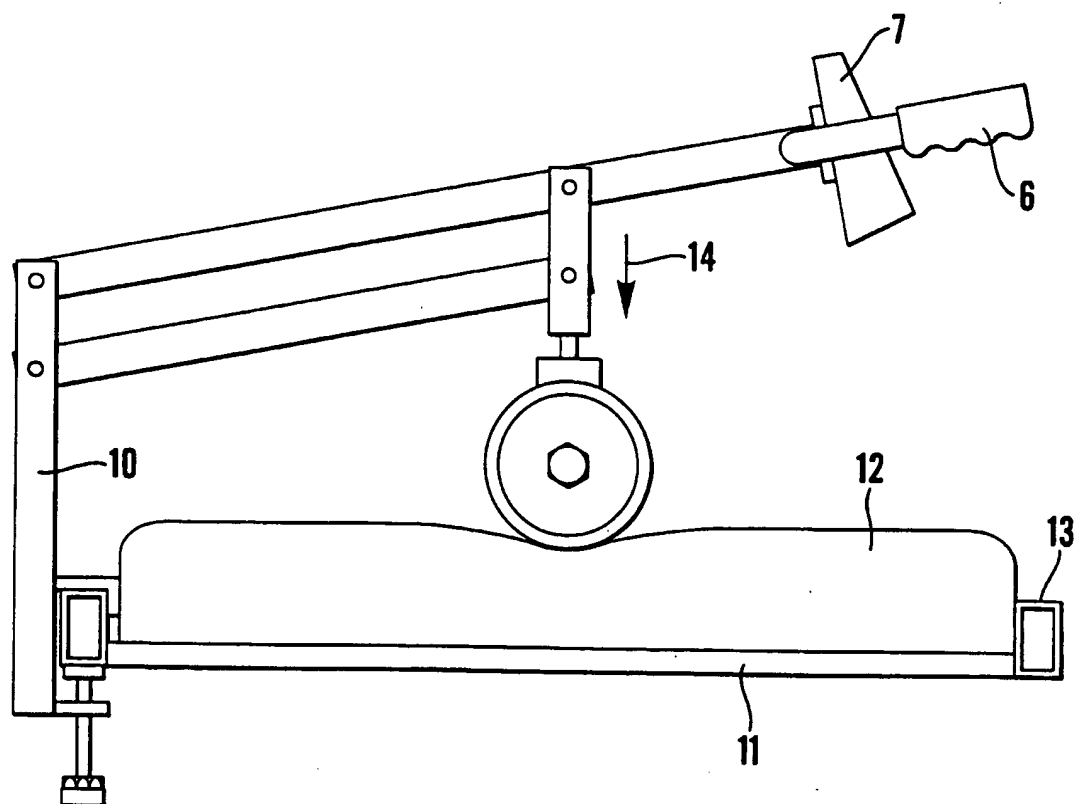


Fig. 2

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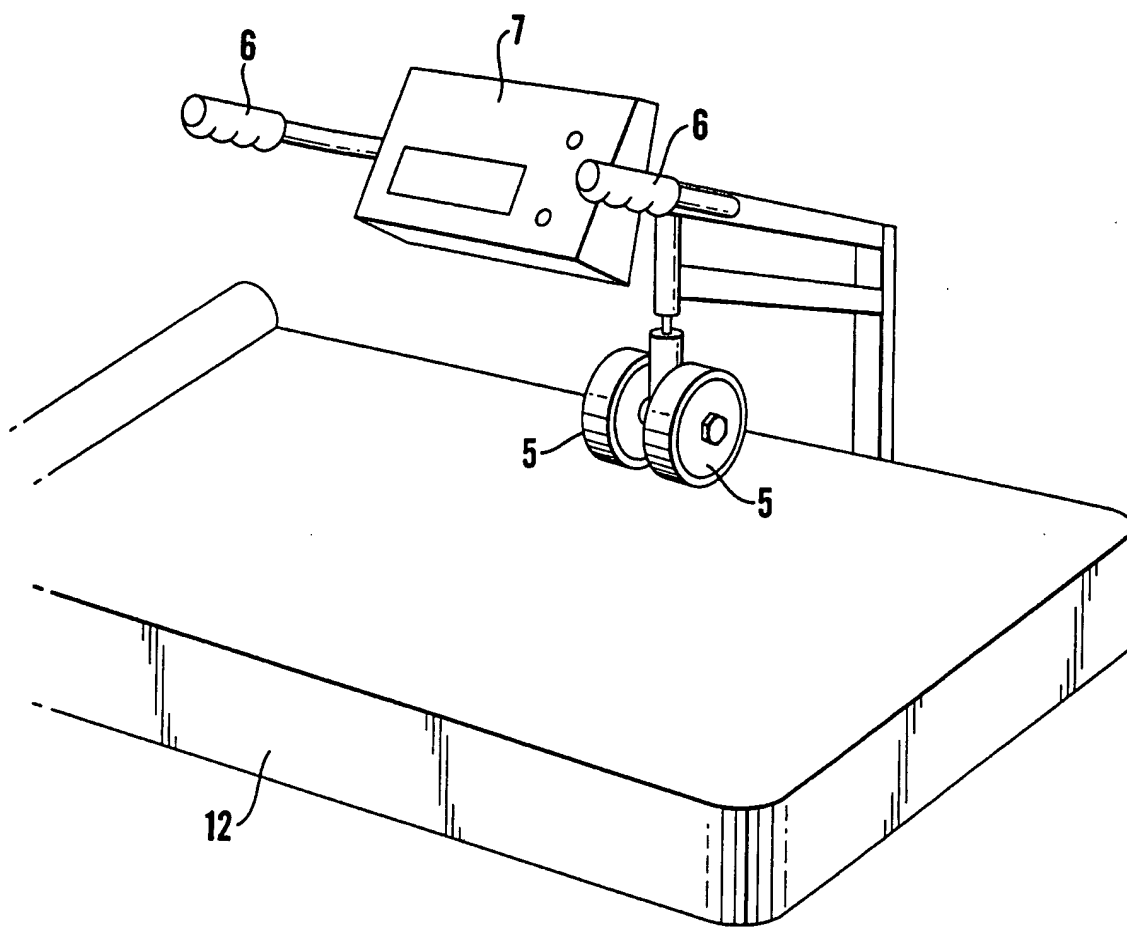


Fig.3

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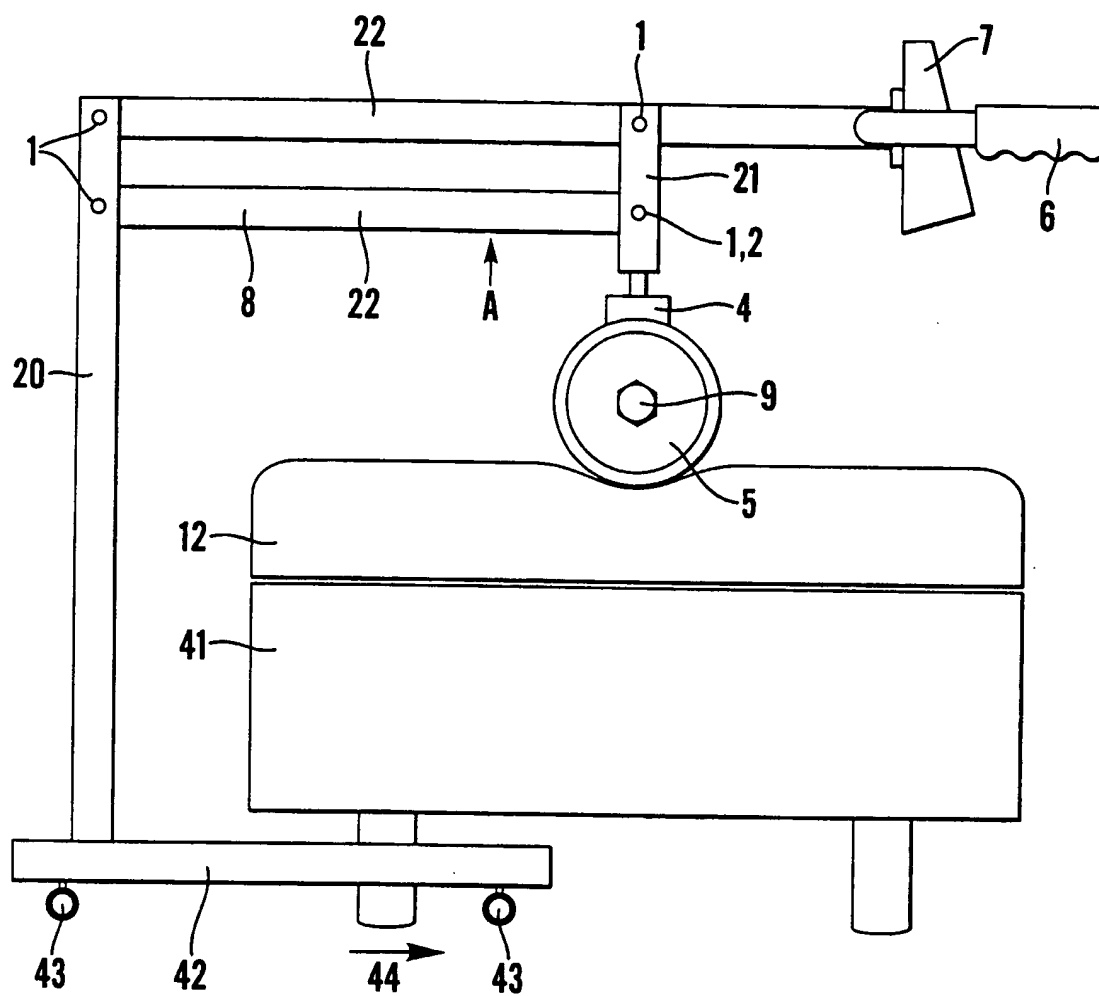


Fig.4

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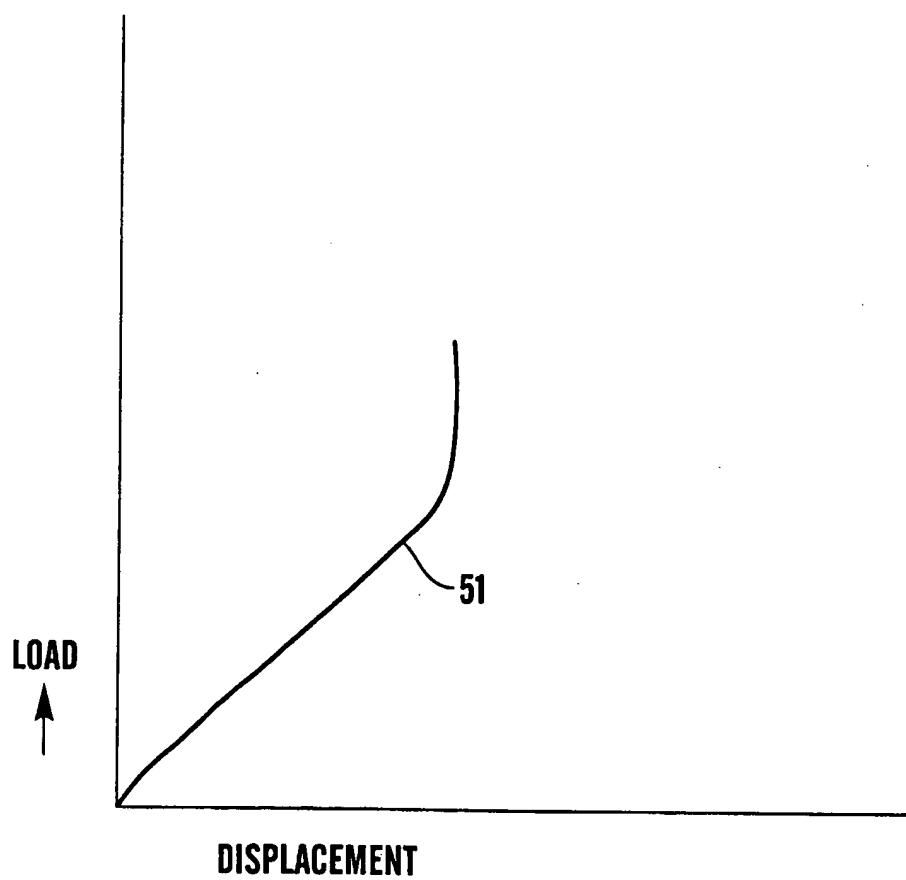


Fig.5

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00704

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47C31/12 G01N3/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47C G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 41 39 697 A (VEITH HORST K) 24 June 1993 (1993-06-24) column 3, line 3 - column 4, line 33 figures 1,2	1-10
A	WO 95 10762 A (SCALES JOHN TRACEY ; BAIN DUNCAN SHIRREFFS (GB)) 20 April 1995 (1995-04-20) page 10, paragraph 2 - page 12, paragraph 2 figures 1,4,6,7	1-10
A	US 4 140 008 A (GOLEMBECK GERALD A ET AL) 20 February 1979 (1979-02-20) column 2, line 7 - line 56 figure 2	1-10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

18 May 2000

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/00704

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 4139697	A	24-06-1993	NONE	
WO 9510762	A	20-04-1995	AT 170974 T	15-09-1998
			AU 7818994 A	04-05-1995
			DE 69413244 D	15-10-1998
			DE 69413244 T	20-05-1999
			EP 0723652 A	31-07-1996
US 4140008	A	20-02-1979	GB 2011084 A,B	04-07-1979